Name of Organization: Michigan DEQ

Type of Organization: State

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Project Title: Air Quality Evaluation Associated with the Stove Change-Out

Project Category: Pollution Prevention and Reduction - BNS

Rank by Organization (if applicable): 1

Total Funding Requested ($): 226,207 **Project Duration:** 2 Years

Abstract:

This project will be a multi-state and federal, public and private collaborative effort with the objective of evaluating potential reductions of pollutants into the Great Lakes Basin. Based on emission inventory data from the Regional Air Pollutant Inventory Development System (RAPIDS) the Great Lakes States have identified wood burning stoves as primary non-mobile contributors of benzo(a)pyrene [B(a)P] into the atmosphere that can be potentially deposited into the Great Lakes Basin. B(a)P has been cited as being linked to cancer in wildlife and humans. As a result, efforts to reduce potential environmental and public health effects by reducing emissions from this source have been initiated. Currently, B(a)P and particulate matter (PM) emissions in the northern lower peninsula of Michigan and northeastern Wisconsin are being targeted by a joint pilot program involving the Hearth Products Association, the United States Environmental Protection Agency (USEPA) and the Michigan Department of Environmental Quality (MDEQ) called, the "Great Stove Change-Out." Following the pilot programs, the exchange will be expanded to the entire Great Lakes Basin. The program allows residents to exchange older wood burning stoves that are prone to higher emissions of PM and B(a)P, and offers discounts on the purchase of new gas or reduced emission wood stoves. Several of the Great Lakes States are proposing the placement of air quality monitoring equipment throughout the Great Lakes Basin to provide background data, and to identify spatial/temporal trends in the region for B(a)P. Previous filters used to collect PM will also be analyzed to provide temporal trend analysis of B(a)P. This will help evaluate the program's success while offering additional data, possibly demonstrating a decrease in PM and B(a)P levels in the region. Air pathways and deposition transcend boarders, the value of a well documented and successful reduction initiative could have nation wide implications.

Geographic Areas Affected by the Project

States:

☐ Illinois	☐ New York	☒ Superior	☐ Erie
☒ Indiana	☐ Pennsylvania	☒ Huron	☐ Ontario
☒ Michigan	☐ Wisconsin	☒ Michigan	☐ All Lakes
☒ Minnesota	☐ Ohio		

Geographic Initiatives:

☐ Greater Chicago ☐ NE Ohio ☐ NW Indiana ☐ SE Michigan ☐ Lake St. Clair

Primary Affected Area of Concern: Not Applicable

Other Affected Areas of Concern:

For Habitat Projects Only:

Primary Affected Biodiversity Investment Area:

Other Affected Biodiversity Investment Areas:

Problem Statement:

Benzo(a)pyrene [B(a)P] has been linked with cancer in wildlife and humans and is on the list of 11 critical pollutants identified by the International Joint Commission's Great Lakes Water Quality Board. The Canada - United States Strategy for the Virtual Elimination of Persistent Toxic Substances in the Great Lakes (i.e. the "Great Lakes Binational Toxics Strategy") signed April 7, 1997 by USEPA Administrator Carol Browner and Canadian Minister of the Environment, Sergio Marchi also identifies B(a)P and the need for elimination of its sources into the Great Lakes Basin. Residential wood combustion (primarily wood stoves) contribute 46% of the non-mobile B(a)P emissions in the States and Provinces surrounding the Great Lakes, based on emission inventory data generated by RAPIDS. Wood stoves also contribute a substantial quantity of PM emissions into the Great Lakes Basin. Of the particles associated with woodburning, 80% are smaller than 2.5 microns and almost all are smaller than 10 microns. Wood stoves manufactured after 1988 are required to meet USEPA standards and have only 10% the emission rate of older wood stoves. Because wood stoves have an extremely long life (87% of existing wood stoves were manufactured before 1988), implementation of a change-out program to replace older units is a successful means of achieving reductions in both B(a)P and PM emissions at their source. A similar program was implemented in Colorado 10 years ago, with one small town,where the entire town exchanged their stoves, and a 60% drop in fine fraction particulates occurred. (1)

With little historical B(a)P data for the change-out region, the States will identify areas in the region where previous particulate filters can be analyzed for B(a)P, coupled with current PM monitoring. To track any pollutant reduction, provide background data, and provide spatial and temporal trends in B(a)P for the Great Lakes region, several sites will need to be equipped with Respirable Particulate (PM10) monitors. After the data has been collected and analyzed it will be available to the sponsors and participants of the stove change-out, local media, as well state and local agencies invested in air quality projects and research.

Proposed Work Outcome:

This project will address the goals of several national and international programs that include B(a)P on their respective "list of pollutants of concern" that aim at further identifying the sources of this pollutant and reducing or eliminating additional releases to the environment. This proposed project will assist in providing information that will demonstrate the progression toward achieving the goal of "virtual elimination" of persistent toxic substances in the Great Lakes in addition to helping evaluate the success of the stove change-out program. Because B(a)P has been primarily associated with particles(2) with aerodynamic diameters of less than 3 microns, existing Respirable Particulate (PM10) monitors will be used. Michigan currently has four available PM10 samplers. Other States contacted also have PM10 samplers available that could also be used for this study, eliminating the need for equipment purchases. The sample collection and analytical method used will be the same method as that used by California (3). To decrease siting costs, current PM2.5 sites will be considered for

PM10 locations, several States have offered to provide personnel resources for sample collection . Significant wood burning located within the vicinity of the PM2.5 monitor sites will also be considered. B(a)P emission data and wood stove sale information will also be reviewed and considered when siting monitors. It is anticipated that three sites will be located in Michigan, one site being co-located, and several other sites are anticipated to be located in other Great Lakes' States and possibly Canada. Indiana and Minnesota have already expressed an interest in operating a site to help evaluate any decline in B(a)P and PM following the regional wood stove exchange. Because of the marked seasonal trend that has been shown in California and Colorado (4), monitoring will primarily be conducted in the winter months. A few samples will be collected in the summer months to verify low or non-detectable amounts of B(a)P. Two years of data will be collected to coincide with the timetable for the wood stove change-out, minimizing the effects of the variability of the wood burning season. In addition, the PM10 filters will be analyzed for possible temporal trend analysis.
The primary samplers would operate once every six days and the co-located sampler would operate every 12 days; all samplers would sample air over a 24 hour period. Financial assistance primarily would be required for laboratory analysis and personnel. The data collected would be linked to profiles that are available for different source categories such as wood burning, diesel sources and mobile sources to delineate any reductions specifically from the wood burning source category. The filters will be analyzed for additional polyaromatic hydrocarbons (at least seven) to help distinguish between wood burning and other sources of B(a)P. The receptor modeling effort would be carried out as an in-kind service by USEPA modeling staff at the USEPA Region 5 office. The results at the end of the term of the project will be made available to the Hearth Products Association, the MDEQ and USEPA (on their web sites), other state agencies within the Great Lakes Basin, and local newspapers.

Project Milestones:	**Dates:**
Project Start- Determination of sites	05/2000
Begin monitoring	09/2000
Complete monitoring	04/2001
Provide status report	08/2001
Begin 2nd year of monitoring	09/2001
Complete 2nd year of monitoring	04/2002
Provide status seport	08/2002
Final review of data and final report	05/2003

☐ Project Addresses Environmental Justice

If So, Description of How:

☒ Project Addresses Education/Outreach

If So, Description of How:

As with any initiative within a community, an element of outreach and education is required to allow citizens the opportunity to participate and view the information collected from the project. To encourage participation, the States will be posting (in various media) the resulting air quality data, as well as the percentage of exchanged stoves from their community. As a result of the change-out program, the Great Lakes States have the opportunity to view not only the levels of participation from their community, but also its effects on air quality (i.e., reduction in B(a)P and PM deposition) after the samples have been collected and analyzed. Validating a project with air quality data can also serve to convey the successes of the community project and can lead to future participation in projects that have a common goal of virtual elimination of toxics in the Great Lakes Basin.

Project Budget:

	Federal Share Requested ($)	Applicant's Share ($)
Personnel:	81,120	7,260
Fringe:	31,380	2,820
Travel:	4,000	0
Equipment:	0	0
Supplies:	1,200	0
Contracts:	88,100	0
Construction:	0	0
Other:	0	0
Total Direct Costs:	205,800	10,080
Indirect Costs:	20,407	1,828
Total:	226,207	11,908
Projected Income:	0	0

Funding by Other Organizations (Names, Amounts, Description of Commitments):

The receptor modeling effort would be carried out as an in-kind service by USEPA modeling staff at the USEPA Region 5 office. Additional in-kind sample collection will be performed by Indiana's Department of Environmental Management and Minnesota's Pollution Control Agency.

Description of Collaboration/Community Based Support:

This project will be a Great Lakes regional study that will involve several other Great Lakes States sharing a coordinated data collection for B(a)P. The Great Lakes' states will be participating by establishing monitoring and collection sites in at least Indiana, Minnesota, and Michigan. The Hearth Products Association will be collaborating on this study by providing public education and the incentive for individuals to trade in their old stoves. The USEPA will also be a key partner in conducting the modeling and facilitating identification of the source sector/s contributing to any reduction in PM or B(a)P. The States and USEPA will work together in assuring that the information is properly conveyed to interested parties such as the public, the BNS workgroups, other states, and federal agencies. Data will also be made available through press releases and the Internet.

References (located here, as per Paul Horvatin's direction)

1) Crouch J. 2000. Personal communication from John Crouch, Hearth Products Association to Joy K. Taylor, Michigan Department of Environmental Quality, Air Quality Division.
2) Pierce, R.C. and M. Katz, "Dependency of Polynuclear Aromatic Hydrocarbon Content on Size Distribution of Atmospheric Aerosols," Environ. Sci. Technol., Vol. 9, 347-353.
3) Poore, M. and D. Hartmann, "PM10 Particulate Polyaromatic Hydrocarbon Monitoring in California: Trends and Interbasin Comparisons,". 1992.
4) Ibid.